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Preparing STEM Teachers through Technology Supported Collaborative Learning

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UGP Mentored Grant Final Report

UGP 2016: Preparing STEM Teachers through Technology Supported Collaborative Learning

There were two major goals of this mentored grant. One was to examine how technology with shared display and multi-user features influences pre-service teachers' participation pattern and social dynamics in collaborative learning activities. The second goal was to help the Principal Investigator receive mentoring on applying for research grants from external funding agencies. Both goals were successfully achieved at the completion of this grant. The report is thus organized by the two goals into the following sections.

Goal I: An Exploratory Research Study about Technology Supported Collaborative Learning among Pre-service Teachers

Research Questions

1. Comparing to individual user based technology, how does technology with shared display and multi-user features of input impact the collaborative practices of the groups?
2. What are the characteristics of the most successful tasks that can support students' learning through technology?

Participants

Thirty-five secondary school candidates who were enrolled in the teacher education program at the University of Montana participated in the study while they took the course of Educational Psychology and Measurement in spring, 2017. Among the 35 participants, eight were majored in the STEM fields.

Procedure

Throughout the semester, students participated in five technology-supported small-group collaborative learning activities, among which three were facilitated by the 27-inch tabletop computers with multi-user functions for each group, and two were

implemented with individual iPads. Immediately after taking part in each collaborative activity, students were asked to submit an online survey to reflect on how well they think the group work has gone and whether technology has supported the group to collaborate better.

Data Analysis and Results

Overall, students reported enthusiasm of using technology to collaborate in class. Comparing between reports of using multi-touch tabletop computers and iPads, students expressed a more positive attitude towards using the multi-touch tabletop computers for sharing and collaborating with group members. They particularly appreciated the large shared screen where everyone would be able to see the progress of the collaboration. However, when the tasks can be divided into smaller chunks for individual work, students preferred to use iPads which allowed them to work on different components of the task simultaneously without waiting for the other group members. This preference was especially true given the constraints of the short class meeting time—50 minutes once each week. Based on students' reports, the characteristics of those tasks that are most successful in supporting students' learning through technology include: 1) being interactive and providing tools for visualization and modeling; 2) allowing the instructor to give timely scaffolding; and 3) enabling different groups to share and comment on each other's learning products.

Goal II: Accelerated Research and Grant Activities

The mentored grant provided partial funds for one course buyout in the spring of 2017. With the benefit of released time from teaching and funding for travel and mentorship, I attended the grant conference at the National Science Foundation and connected with potential future collaborators. I also participated in a writer's workshop organized by the editors of the most respected journals in my field, where I received excellent mentoring from senior scholars in how to write and publish in those well-regarded journals. Following the workshops, I have submitted three manuscripts; one is in press and two are under review.

During the year of 2016-17, I submitted a total of five grant proposals—two internal grants and three external grants. Though I was only awarded the internal UGP small grant, I received thorough and positive feedback on the other applications. I became familiar with the requirements of the extramural funding agencies including both private foundations, such as the Spencer Foundation, and large federal agencies, such as the National Science Foundation and the National Institute of Health. Using the feedback provided, I am currently revising two proposals and will resubmit them soon. In addition, I served as a collaborator and Senior Personnel on a recently submitted Track II EPSCoR National Science Foundation grant proposal with a requested budget of four million dollars.